

Case study of simultaneous observations of sporadic sodium layer, E-region field-aligned irregularities and sporadic E layer at low latitude of China

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Using the Na lidar at Haikou (20.0°N, 110.3°E), the VHF coherent radar and the digital ionosonde both at Sanya (18.4°N, 109.6°E), cases of simultaneous observations of sporadic sodium layer (SSL), E-region field-aligned irregularities (FAI) and sporadic E layer (Es) in the mesosphere and lower thermosphere (MLT) region at low latitude of China are studied. It is found that SSL occurs simultaneously or follows the enhancement of Es and FAI. The Es, FAI and SSL descend slowly with time which is mostly controlled by the diurnal tide (DT). Besides, the interaction of gravity wave (GW) with tides can cause oscillations in FAI and SSL. Our observations support the neutralization of ions for SSL formation: when the metallic ions layer descends to the altitudes where models predict, the sodium ions convert rapidly to atomic Na that may form an SSL event. Moreover, the SSL peak density will increase (decrease) in the convergence (divergence) vertical shear region of zonal wind.